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Research Article

Preparing Digital Stories through the Inquiry-Based Learning Approach: Its Effect on Prospective Teachers' Resistive Behaviors toward Research and Technology-Based Instruction

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Abstract

The purpose of the study was to determine the effect of preparing digital stories through an inquiry based learning approach on prospective teachers' resistive behaviors toward technology based instruction and conducting research. The research model was convergent parallel design. The sample consisted of 50 prospective teachers who had completed their education at Mersin University's Preschool Teaching Program during the 2013-2014 academic year The experimental group was asked to prepare a digital story based on an inquiry based learning approach and then to integrate it into their instruction at Mersin University's Application Kindergarten and Preschool. The control group, however, prepared digital stories based on an explanatory teaching approach. Data were collected using such measurement tools as the *Resistance toward Research Scale* and the *Resistance toward Technology Based Instruction Scale* both before and after implementation. Moreover, prospective teachers' own views on their resistive behaviors and the sources of such behaviors were gathered using questionnaires. The results of the study indicated that a significant difference existed between the experimental and control group's resistive behaviors. The factors leading to resistance toward conducting research included academicians' not taking the role of a guide, learners' negative feelings, the inexistence of interactive learning environments, and the frequency of conducting research. Furthermore, prospective teachers' resistive behaviors towards technology based instruction were found to be due to academicians' qualifications, the inexistence of various technology based instruction activities, and negative perceptions toward technology based instruction.

Keywords

Inquiry based learning • Digital story • Resistive behavior

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As knowledge has become more easily accessible, humans have experienced an increase in information at their immediate disposal (UNESCO, 2002), leading them to have acquired a number of qualities and capabilities. Such capabilities as being able to conduct research and being able to use information and communication technologies effectively are indispensable attributes that all individuals should have (Partnership for 21st Century Skills, 2010). A curriculum that not only provides individuals opportunities to be active in the learning process, to innovate, and to use information and communication technologies, but also makes them responsible for their own learning is needed to cultivate individuals with such attributes. Turkey's Higher Education Institution is currently undergoing a reorganization process at the fundamental level so that each university may determine its own program qualifications in light of the European Union Qualifications Framework as a result of the Bologna process. While program qualifications are being determined, the ability of learning how to learn as well as communication and social competencies are among the competencies all individuals should have. Therefore, individuals are expected to graduate from the university by attaining such competencies as self-learning, using information and communication technologies effectively. Owing to this, learning environments should be designed to instill in university students such competencies. Considering that students studying in schools of education will become role-models to their future students, they are expected to conduct research and design technology based learning environments in an effective way. Instilling prospective teachers with such competencies is tantamount to giving them the opportunity to conduct research and to integrate technology into their instruction while they are still university students in their respective School of Education. In the current study, the researchers expect that prospective teachers' resistive behaviors toward technology based instruction either decrease or be abandoned altogether by giving them the opportunity to prepare a digital story and to integrate it into their instruction process. Moreover, prospective teachers were asked to conduct research on their own, to use information and communication technologies while conducting their research, to take responsibility in conducting research so that they may be able to observe for themselves a difference in their own resistive behaviors toward conducting research. In short the researchers envision that not only will prospective teachers' resistance toward conducting research be precluded as a result of their having participated in inquiry based teaching activities, so will their resistance toward technology based instruction decreased after having preparing a digital story and integrating it into their own preschool and kindergarten practice. As such, this study is, in essence, a proposition on how to lessen or to remove prospective teachers' resistive behaviors.

Technology Integration into Instruction and Digital Storytelling

Technology integration into instruction has become a necessity in the current age. How to integrate technology into instruction and the obstacles beyond technology integration have been discussed for years by a large quantity of educators (Lowther, Strahl, Inan, & Ross, 2008). No standard definition for technology integration may be found in the literature. Some researchers define technology integration as a teacher's high level use of computers, in which for example, students make projects with the help of multimedia tools, or low level use, in which students might conduct research on the internet (Cuban, Kirkpatrick, & Peck, 2001). Other researchers consider technology integration to be when teachers integrate technology into instruction in order to render activities more reliable and productive (Hennessy, Ruthven, & Brindley, 2005). It is emphasized that teachers' own personal tendencies, such as their openness to changes in educational technologies and their desire in participation in technology education, facilitate their success in integrating technology into their instruction (Vannatta & Fordham, 2004). According to Ertmer (2005), the reason behind teachers' inability to integrate technology into their instruction is due to their negative attitudes toward technology integration. Butler (2010) also states that teachers' perceptions toward technology affect whether or how well they integrate technology into their instruction. Moreover, many studies in the literature indicate the relationship between teachers' use of technology in the class and their attitudes toward technology (Butler, 2010; Ertmer, 2005; Ertmer, Ottenbreit Leftwich, Sadik, Sendurur, & Sendurur, 2012; Okojie & Olinzock, 2006; Sang, Valcke, van Braak, Tondeur, & Zhu, 2011; Teo, 2011; Zhao & Frank, 2003). Having a negative attitude toward technology integration in teachers is considered an obstacle for technology integration into instruction. Therefore, innovative technology based instruction may play a significant role in lessening or removing teachers' negative attitudes toward computers and technology. According to Ertmer (2005), training teachers on how to use both simple and effective technological tools and how to integrate them into instruction is a powerful way of starting the process of accepting technology based instruction. Using digital storytelling in teaching may be considered easy because preparing a digital story using technology may be done in a shorter time and at a lower expense than more tradition means. Accordingly, this study aims to reduce prospective teachers' resistive behaviors toward technology based instruction by giving them an opportunity to prepare a digital story and to integrate it into their own instruction.

Digital Storytelling

Ohler (2008) defines digital storytelling in his book titled *Digital Storytelling in the Classroom* as a creative process of integrating traditional narration with such personal digital technologies as a computer, video camera, or voice recorder. Digital

storytelling is also defined as a narrator telling a story with the help of multimedia tools and communicating it to listeners (Yuksel Arslan, 2013). Nguyen (2011) describes digital storytelling as a composition mixing a narration used for communication from past to present with digital technologies. Robin details three main categories for which digital storytelling may be used: *personel stories*, *stories for informing or teaching*, and *historical stories*. The most popular type of digital story is personel stories, in which a person tells his/her personal experiences. Digital stories for informing or teaching are used as teaching material for each different subject. Historical stories are those in which historical events are told.

Lambert (2007) lists seven main elements of effective digital story: These are *point of view, dramatical question, emotional content, economy, rhythm, music,* and *contribution of voice. Point of view* is the message aimed to be communicated. It leads to communication between the listener and narration and answers such question as "What is the story's message?" or "What is the purpose of telling such a story?" A *dramatical question* is the question answered at the end of the story that attracts listeners' curiosity throughout the story. The listener has a question in mind at the throughout the exposition until the climax of the story that is not fully answered until the final part of the story. At the final part of the story, the listener finds the answer of this question. *Emotional content* is an element attracting the listener's attention. *Economy* means to prepare a digital story with limited video or photo resources, a limited number of words, or a limited number of time (e.g. not exceeding three or five minutes). *Rhythm* refers to the story's flow and depends on the content of the story and the emotions depicted in it. For example, the rhythm of melancholic story will not be same as that of happy story. The *music* selected increases the narration's power and depends on the type of story being told. *Contribution of voice* is to vocalize the story by means of a narrator. Adding a narrator's voice to the story, enables the listeners to understand the story more easily and to grasp the emotions expressed in it by making them feel as if they were hearing an eye witness report.

The Process of Preparing a Digital Story

In the literature, it is stated that a digital story may be prepared for different purposes not only by teachers, but also by students (Behmer et al., 2006; Butler, 2010; Doğan & Robin, 2009; Sadik, 2008; Thompson, 2014; Yuksel, 2011; Yuksel, Robin, & McNeil, 2010). As such, both teachers and students should have not only the knowledge of how to prepare a digital story, but also the experience of having prepared one. In general, the process of digital story preparation traditionally begins with the writing phase and includes brainstorming, subject selection, and design. While designing, students compose a story board in order to visualize how the story will transpire. The production phase follows the designing process. During this

phase, students combine such elements as voice, music, and visuals on a computer using Movie Maker or iMovie softwares in Windows XP or Microsoft Photostory program downloaded free of charge to digitalize the story (Bull & Kajder, 2004; Yuksel Arslan, 2013). Although students share their digital stories during the process, the process itself ends when students present their digital stories.

Jakes and Brennan (2005) explain the digital story preparation process at a six-phase process consisting of the *writing process*, *scenario production*, *story board composition*, *researching multimedia elements*, and *generating and sharing the digital story*. The writing process begins with students' decision on a subject based on their research and/or their previous experiences. Producing a draft scenario follows. Attention should be paid so that the story follows a central theme in the draft scenario (Robin, 2007). After students' draft digital stories have been reviewed, they share them with an audience and receive feedback on them (Barret, 2009). Giving feedback and making corrections continues until the draft digital story takes its final form. The third phase consists of finding multimedia elements. Students research visual (video, photo, or picture) and audio (music and voice) elements in order to make their digital stories more meaningful and less costly. After research visual and audio elements, multimedia materials are added to the video setting program so that they can be vocalized. The prepared digital story is then saved as a video. The process concludes with the digital story being shared with an audience which may include one's classmates and even internet followers from various parts of the world.

To sum up, the researchers expect that prospective teachers' resistive behaviors toward technology based instruction and conducting research will either be lessened or completely abandoned by having them generate a digital story based on an inquiry based learning approach and then integrate it into their instruction in a preschool or kindergarten setting. Accordingly, answers to the following research questions have been solicited:

i. Is there a significant difference between the experimental and the control groups' resistive behaviors both before and after the process of digital story preparation?
ii. What are prospective teachers' views on their own resistive behaviors toward technology based instruction and conducting research before and after the implementation?
    ii.a. What are prospective teachers' views on their own resistive behaviors towards technology based instruction before and after the activity on digital story preparation and its integration into instruction?
    ii.b. What are prospective teachers' views on their own resistive behaviors toward conducting research before and after the activity on digital story preparation and its integration into instruction?

Method

The study has the aim of determining the effect on prospective teachers' resistive behaviors by preparing digital stories through inquiry-based learning and integrating them with their instruction and has been designed using mixed methods. Greene (2007) stated that mixed methods are used for different purposes in research, such as for triangulating, complementing, developing, initiating, and expanding. Triangulation and complementary mixed-methods are used to deeply examine different dimensions of a research problem through various data collection tools using quantitative and qualitative research techniques together in a study. Various classifications of mixed methods are found in the literature. For example, Morse (1991, as cited in Tashakkori & Teddue, 2003) classified mixed methods as concurrent triangulation and sequential triangulation in terms of the sequence of data collection and the dominance of data sets. With regard to Morse's classification, qualitative and quantitative data are collected concurrently in order to deeply examine resistive phenomenon before and after implementation in the study. Concurrent triangulation has been used in this research.

Creswell and Plano Clark (2007) explain mix-methods research through six designs: convergent-parallel, explanatory-sequential, exploratory-sequential, embedded, transformative, and multiphase. With regard to Cresswell and Plano Clark's classification, the current study has used the convergent parallel design. According to this design, quantitative and qualitative data are gathered concurrently during the same phase of research. Both having equal significance, neither qualitative nor quantitative data have any priority. After analyzing the qualitative and quantitative data separately, they are then compared and interpreted together in order to explain the same phenomenon. This study's research model is presented in Figure 1.

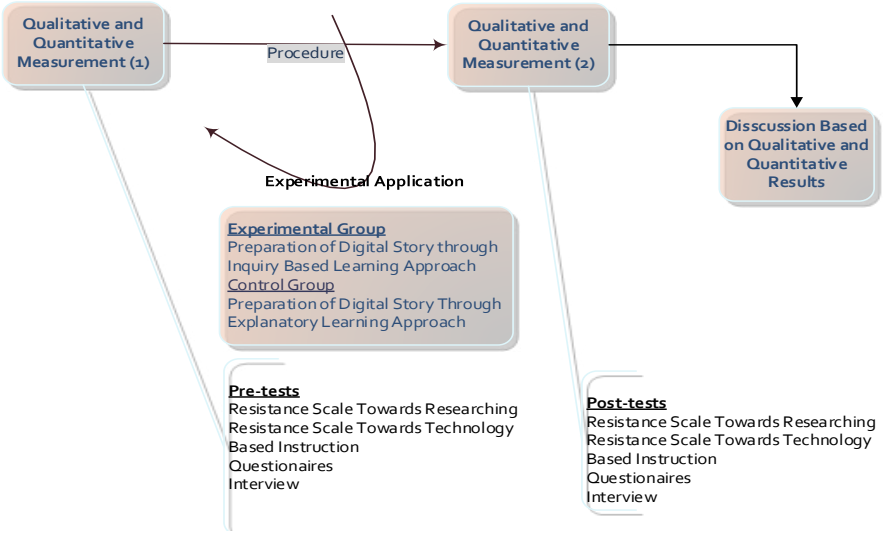

Figure 1. The research model.

The Research Sample

The study was carried out with the participation of 50 prospective teachers who were studying at the Preschool Teaching Program in Mersin University and taking the Instructional Technologies and Material Design class during the 2013-14 academic year. The quantitative phase of the research was designed using the quasi-experimental model with matched control and experimental groups who had been administered pre- and post-tests. The groups were matched in regard to gender, age, previous knowledge of digital storytelling, and resistive behaviors. When examining the frequencies and percentages of the experimental group in terms of gender, 80% of the group (n = 20) were female and 20% of the group (n = 5) were male. In contrast, 88% of the control group (n = 22) were female and 12% of them (n = 3) were male. The mean age of the experimental group was 20.08, while the control group's was 20.12. Because of the low population ($n \leq 30$) for both the experimental and control groups, the results from the Shapiro-Wilk test were examined. Findings from the normality tests indicated that the pre-test scores of both the experimental and control groups in terms of resistive behaviors toward research and technology-based instruction had normal distribution ($p > .05$). Accordingly, the *t*-test results for independent samples, which was made to determine if the experimental and control groups were equal in terms of these resistive behaviors, are presented in Table 1.

Table 1
Equality of Experimental and Control Groups in terms of Pretest Results for Resistive Behavior

Variable	Group	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Resistance towards researching	Experimental	25	110.44	32.21	48	0.047	0.962
	Control	25	110.00	33.41			
Resistance towards technology-based instruction	Experimental	25	85.04	23.26	48	1.225	0.227
	Control	25	77.64	19.25			

Note. $p > .05$.

No significant difference was observed between the pretest results of the experimental and control groups in terms of resistive behaviors toward research and technology-based instruction in Table 1 ($p > .05$). This finding demonstrates that prospective teachers in both the experimental and control groups had equal resistive behaviors before the experimental implementation. After demonstrating equality between groups, half of the prospective teachers were randomly assigned to the experimental group and the other half to the control group.

Data Collection Tools

Resistance Towards Research Scale. The prospective teachers' resistive behaviors toward research were determined before and after the experimental application with the help of a resistance scale developed by the researcher (Yavuz Konokman, 2015).

Variance of the scale was provided through both exploratory and confirmatory factor analyses. Exploratory factor analysis of the study indicated that the scale has seven components and one factor. Seven components altogether explain 58.01 of the total variance. The one factor explains 32.482% of the variable on its own, and Cronbach's alpha of reliability for the whole scale is .942, indicating that the scale's items are homogenous and the scale has a single factor. As a result of confirmatory factor analysis, goodness-of-fit indices related to the model (GFI = .87; IFI = .98; NFI = .97; NNFI = .98) indicate proof that the model has excellent fit, RMSEA = .057; CFI = .98; AGFI = .86. Moreover, the model's appropriateness to the observed structure can be stated based on the finding that χ^2 / *(degrees of free[df])* ≤ 5 (2721.74/695 = 3.916). Cronbach's alpha of reliability for the whole scale is .942, and Cronbach's alphas for the scale's components are .899, .874, .813, .825, .747, .746, and .799, respectively, indicating the scale's reliability. Moreover, the test-retest analysis results show a positive correlation between the pretest and post-test scores ($r = .494$, $p < .05$). From these findings, the test-retest reliability of the scale is considered to be high.

Resistance towards Technology-Based Instruction Scale. The prospective teachers' resistive behaviors toward technology-based instruction were determined before and after the experimental application with the help of the resistance scale developed by the researcher (Yavuz Konokman, 2015). Exploratory factor analysis of the study indicated that the scale has five components and one factor. The five components altogether explain 57.136% of the total variance. The eigenvalue of the first factor is 12.617, which is six times greater than the eigenvalue of the second component (2.584), indicating that the scale has a single factor structure. Cronbach's alpha of reliability for the whole scale was calculated as .906, and Cronbach's alphas of reliability for the scale components were found to be .91, .872, .87, .778, and .831, respectively. Moreover, the test-retest analysis results showed a positive and medium correlation between the pre- and post-test scores ($r = .354$, $p < .05$). As a result of confirmatory factor analysis, goodness-of-fit indices for the model (GFI = .90; CFI = .99; IFI = .99; NNFI = .98) prove that the model has excellent fit, RMSEA = .057; CFI = .99; AGFI = .88. Moreover, the model's appropriateness to the observed structure can be stated based on the finding that χ^2 / $df \leq 5$ (1890.06 / 490 = 3.857). Therefore, explanatory and confirmatory factor analyses, as well as the reliability analysis, proved the reliability of the resistance scale and its variance in determining if prospective teachers have resistive behaviors toward technology-based instruction.

Questionnaires. The questionnaires, composed of open-ended questions so prospective teachers could explain their views in detail, were prepared to determine their resistive behaviors toward research, the sources of these behaviors, and suggestions to lessen these behaviors. Firstly, the problem was defined while

preparing the questionnaire. In this stage, the question "What kind of knowledge do you plan to reach through this measurement tool, and from whom do you plan to obtain this knowledge?" were answered. After the question had been answered, the items that explained the problem in detail were written down. Experts' views on measurement and evaluation, as well as curriculum and instruction, were received for the drafted items. Necessary corrections were made in accordance with the experts' opinions, and the questionnaire took its final form. A similar process was followed for developing the Resistance Towards Technology-Based Instruction Scale.

Reliability and Validity Studies

Internal validity of the quasi-experimental design. The validity of this design was ensured by dividing the participants equally in terms of variables such as gender, age, resistive behaviors toward research and technology-based instruction, prior knowledge of digital story preparation, and randomly assignment of the participants into experimental and control groups. Moreover, validity and reliability studies were made on the measurement tools used in the research. Statistical analyses of the research measurement tools indicated that they were reliable and valid tools with parametric features. Variance in the application process was one other factor that affected internal validity (Fraenkel & Wallen, 2006). The researcher instructed both the experimental and control groups on how to overcome this obstacle. Additionally, the instructional application was video recorded and analyzed by both the researcher and a viewer each week. Whether or not the experimental group had received the different training they should have compared to the control group was viewed and discussed by the researcher and the viewer. Other strategies that provided validity to the study are designing activities related to the same objectives for each group, giving each the same length of instruction, and using the same instructor for each group.

Internal validity of the qualitative research design. Strategies used in this research to provide internal validity for the qualitative research design included *external audits, rich descriptions,* and a *chain of evidence* (Creswell, 2003). In addition, *triangulation, comparison*, *and quasi-statistics* were other strategies used to raise the study's internal validity (Maxwell, 1996). In this sense, preparing the measurement tools with the help of experts, making detailed descriptions of the study groups and instructional process, presenting findings alongside quotations, using various data collection tools to explain the findings in detail, collecting qualitative data from the experimental and control groups under different conditions, and digitizing the qualitative data using the NVivo 7 program all support the internal validity of the study.

The Application Process

Both experimental and control groups attended the Instructional Technologies and Material Design Course for eight weeks. The experimental group was asked to prepare a digital story (write a scenario, generate both visual and audio elements, combine these elements, compose the digital story with the use of a digital story preparation program (e.g. Photo Story, Moviemaker, etc.) and share the digital story) using the inquiry-based learning approach. They were also expected to integrate their own digital story in their instruction at Mersin University's Application Preschool and Kindergarten. In contrast, the control group was asked to generate a digital story using the explanatory learning approach.

Data Analysis

The program, SPSS 17, was used to analyze the qualitative data, and the difference between means was tested. First, the dependent variable was examined for normal distribution in terms of the independent variable in order to make the difference tests. The Shapiro-Wilk test ($n < 30$) was performed to indicate whether the post-test mean scores of the experimental and control groups were distributed normally for resistive behaviors towards research and technology-based instruction. The test results indicated that the pre- and post-test results of both groups were distributed normally ($p > .05$) for resistive behaviors. As such, the *t*-test for dependent samples was applied to determine whether the pre- and post-test scores of both groups had a statistically significant difference for resistive behaviors toward research and technology-based instruction. The *t*-test for independent samples was used to determine whether the post- test scores for the two groups had a statistically significant difference for resistive behaviors. In addition, qualitative data gathered from both groups were analyzed using inductive content analysis. The Nvivo 7 program was used in the process of analyzing the qualitative data. The questionnaire forms belonging to both experimental and control groups were first transferred to a digitized platform then these data were ready for analysis with the Nvivo 7 program. All data were examined for the purpose of making them meaningful, and they were analyzed in four phases: (a) coding the data, (b) finding themes, (c) organizing codes and themes, (d) and describing and interpreting the data (Yildirim & Simsek, 2011). After qualitative data analysis, all data were described under themes and codes. The frequency of codes is presented in the tables. Finding the differences in frequency of prospective teachers' resistive behaviors before and after the application are presented in crosstabs. Also, the models containing the themes and codes gathered in the study were generated using Nvivo 7. As a result, qualitative data has been visualized and made more meaningful for readers.

Results

Findings from the Quantitative Data

Quantitative findings on research resistance. The results of the *t*-test for independent samples for determining if mean scores for resistance towards research between the experimental and control groups had a significant statistical difference are presented in Table 2.

Table 2
Post-test Scores of Experimental and Control Groups' Research Resistance: The t-Test Results for Independent Samples

Group	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Experimental	25	70.32	22.83	48	2.718	.009
Control	25	88.40	24.18			

Note. $p < .05$.

Upon viewing Table 2, a statistically significant difference can be observed in the post-test mean scores for resistance towards research between the experimental and control groups ($t_{48} = 2.718$; $p = .009$). After the procedure, the experimental group's mean score for resistance towards research was determined to be 70.32 with a standard deviation of 22.83; the control group's mean resistance towards research was determined to be 88.40 with a standard deviation of 24.28. This finding indicates that the experimental group was less resistant towards research compared to the control group.

The *t*-test results for dependent samples are presented in Table 3, in regard to determining whether any difference had occurred between the posttest and pretest scores of the experimental group.

Table 3
Experimental Group's Pre- and Post-Test Scores for Resistive Behaviors Towards Research: The t-Test Results for Dependent Samples

	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Pre-test	25	110.44	32.21	24	6.017	.00
Post- test	25	70.32	22.83			

Note. $p < .05$.

A statistically significant difference between the experimental group's pre- and post-test scores for resistive behaviors towards research was found ($t_{24} = 6.017$; $p = .00$). Upon examining the findings, the experimental group's mean pretest score for resistive behaviors was 110.044 with a standard deviation of 32.21; their mean post-test score was 70.32 with a standard deviation of 22.83. One can infer from the findings of the experimental group's post-test scores that their resistive behaviors had decreased compared to their pre-test scores.

Table 4 shows the *t*-test results for dependent samples, which had been carried out to examine the difference between the pre- and post-test scores of the control group's resistive behaviors.

Table 4
Control Group's Pre- and Post-Test Scores for Resistive Behaviors Towards Research: The t-Test Results for Dependent Samples

	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Pre-test	25	110	33.41	24	5.606	.00
Post-test	25	88.40	24.18			

Note. $p < .05$.

The *t*-test results for dependent samples indicated a statistically significant difference between the pre- and post-test scores of the control group's resistive behaviors towards research ($t_{24} = 5.606$; $p = .00$). The control group's mean pretest score for resistive behaviors was 110 with a standard deviation of 33.41; their mean post-test score was 88.40 with a standard deviation of 24.818. From the findings, the post-test scores of the control group's resistive behaviors can be understood to have also decreased compared to their pre-test scores.

The *t*-test for independent samples is done to determine whether a statistically significant difference exists between the scores of the experimental and control groups. As a result of normality tests, the scores for resistance behaviors towards research show a normal distribution in terms of the group variable ($S\text{-}W_{experimental} = 0.923$, $p > .05$; $S\text{-}W_{control} = 0.945$, $p > .05$). The *t*-test results for independent samples are presented in Table 5.

Table 5
Scores Obtained for the Experimental and Control Groups: The t-Test Results for Independent Samples

Group	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Experimental	25	-40.12	33.33	48	2.405	.020
Control	25	-21.60	19.26			

Note. $p < .05$.

The t-test results for independent samples indicated the change in resistance towards research was greater in the experimental group than in the control group. As a result, a statistically significant difference was determined between the experimental and control groups' mean scores for resistance towards research ($t_{48} = 2.405$, $p = .020$).

Quantitative findings on resistance towards technology-based instruction. The *t*-test results for independent samples carried out after the experimental procedure to determine if prospective teachers' mean scores for resistive behaviors toward technology-based instruction differed statistically between the experimental group and the control group are presented in Table 6.

Table 6
Post-test Scores of Experimental and Control Groups' Resistance Towards Technology-Based Instruction: The t-Test Results for Independant Samples

Group	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Experimental	25	62.52	18.19	48	1.353	.182
Control	25	70.60	23.66			

Note. $p > .05$.

The *t*-test results for independent samples indicate that there wasn't any statistically meaningful difference in posttest scores of the experimental and control groups' resistive behaviors towards technology-based instruction ($t_{48} = 1.353$; $p = .182$). The experimental group's mean post-test score was 62.52 with a standard deviation of 18.19 while the control group's mean post-test score was 70.60 with a standard deviation of 23.66.

The *t*-test results for dependent samples, done to determine if any difference exists between the experimental group's posttest and pretest scores for resistive behaviors toward technology-based instruction are presented in Table 7.

Table 7
Experimental Group's Pre- and Post-Test Scores for Resistive Behaviors Toward Technology-Based Instruction: The t-Test Results for Dependent Samples

	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Pre-test	25	85.04	23.26	24	5.029	.00
Post-test	25	62.52	18.19			

Note. $p < .05$.

A statistically significant difference was found between the experimental group's pre- and post-test scores for resistive behaviors towards technology-based instruction ($t_{24} = 6.017$, $p = .00$). Upon examining the findings, the experimental group's mean pre-test score for resistive behaviors was 85.04 with a standard deviation of 23.26; their mean post-test score was 62.52 with a standard deviation of 18.19. One can infer from the findings that the experimental group's post-test scores for resistive behaviors had decreased compared to their pre-test scores.

The *t*-test for dependent samples was carried out to examine the difference between the control group's mean pre- and post-test scores for resistive behaviors toward technology-based instruction, as shown in Table 8.

Table 8
Control Group's Pre- and Post-Test Scores for Resistive Behaviors Toward Technology-Based Instruction: The t-Test Results for Dependent Samples

	n	$\bar{x}$	*SD*	*df*	*t*	*p*
Pre-test	25	77.64	19.25	24	1.742	.094
Post-test	25	70.60	23.66			

Note. $p > .05$.

The *t*-test results for dependent samples indicated no statistically meaningful difference between the control group's mean pre- and post-test scores for resistive behaviors toward technology-based instruction ($t_{24} = 1.742$, $p = .094$). The control group's mean pretest score for resistive behaviors was 77.64 with a standard deviation of 19.25; their mean post-test score was 70.60 with a standard deviation of 23.66. The control group's post-test scores for resistive behaviors toward technology-based instruction were understood from the findings to also have decreased compared to their pre-test scores. However, the difference between their pre- and post-test scores for resistance behaviors toward technology-based instruction was not statistically significant.

The *t*-test for independent samples needs to be done in order to determine if there is a statistically significant difference between the experimental and control groups' scores. As a result of the normality tests, the prospective teachers' scores for resistive behaviors toward technology-based instruction did not have a normal distribution in terms of the variable of group ($S\text{-}W_{experimental} = 0.910$; $p < .05$; $S\text{-}W_{control} = 0.868$, $p < .05$). Based on this finding, the results of the Mann-Whitney U-test are presented in Table 9.

Table 9
Experimental and Control Groups' Scores for Resistive Behaviors toward Technology-Based Instruction: The Mann Whitney U Test Results

Group	n	Mean of Rank	Sum of Rank	*U*	*p*
Experimental	25	21.58	539.50	214.500	.057
Control	25	29.42	735.50		

Note. $p > .05$.

While the rank mean of the assessed scores of the experimental group's resistive behaviors toward technology-based instruction was 21.58, the control group's mean assessed score was 29.42. As a result of the Mann-Whitney U test, no statistically significant difference was observed in these scores between the experimental and control groups ($p = .057$).

Findings from the Qualitative Data

Qualitative findings on the experimental group's research resistance behaviors toward research of the experimental group. The answers to the question "What kind of resistive behaviors do you show toward your instructor's desire for you to do research?", which had been asked before the experimental procedure, were examined as having the sub-themes of *shows resistance* and *doesn't show resistance* under the theme of *resistive condition*. This theme is explained through codes like *avoidance* (n = 7), *unwilling to adapt* (n = 7), *talks back* (n = 6), *communicates directly* (n = 3), *cheats* (n = 5), and *gets help from other students* (n = 3). Some of the prospective teachers' views supporting this finding are presented below:

(P1) "When researching, I am unwilling and continuously complain about it. I cannot understand what the instructor wants us to do because they don't explain enough when assigning any research homework; as such, I generally prefer to do superficial research."

(P23) "I research haphazardly, or whenever I find any information about the subject I'm searching for, I stop researching. Moreover, I don't finish my research."

(P13) "I don't want to make eye contact with the instructor and generally sit in the back. I am not interested in the course."

Prospective teachers' views on the factors leading to their resistive behaviors toward research are classified through the sub-themes of *instructor source*, *learner source*, *process source*, and *curriculum source* under the theme of sources of resistance towards research. Under the sub-theme of instructor source, the following views were presented: *instructors' don't take the role of guide often enough* (n = 12) and *they don't give detailed explanations* (n = 9).Some of the prospective teachers' opinions were *learner's negative feelings* under the sub-theme of learner source, and under the sub-theme of process source, *lacks an instructive process* (n = 3), *lacks an interactive learning environment* (n = 2), and *too much research done outside of school hours* (n = 2). Some prospective teachers' views supporting the themes and subthemes of sources of resistance towards research are presented below:

(P13) "I show resistance because I haven't learned the subject completely and am afraid of graduating from university with a lack of knowledge."

(P23) "From my point of view, the reason why we show resistance towards research is because the instructors overburden us. Moreover, they don't guide us adequately through the research process."

Answers to "Did you show any resistive behavior towards the instructor's request to do research in the Instructional Technologies and Material Design course and can you give examples?", which was asked after the experimental procedure, have been examined as the sub-themes of *showing resistance (n = 1)* and *not showing resistance* (n = 22) under the theme of resistive condition. The experimental group's answers to the question "how did preparing a digital story through the inquiry-based learning approach affect your resistive behaviors toward research?" indicated that the prospective teachers' resistive behaviors toward research had lessened or disappeared. The experimental group's views were examined under the theme of elements that lessen resistance in the sub-themes of *elements of the research process, reflecting research onto the individual, elements based on the instructor, elements based on content, elements based on individual characteristics*. Under the sub-theme of reflecting research onto the individual, exploring the positive aspects of research

(n = 13) and developing positive attitudes towards research (n = 13) were views stated by a large number of prospective teachers. A frequently stated opinion by the prospective teachers under the sub-theme of elements based on content is that the content becomes meaningful and useful for learners (n = 10). Most prospective teachers also emphasized that instructors' effective guidance (n = 12), as well as interactive (n = 7) and cooperative (n = 6) learning environment were some of the factors that had lessened their resistive behaviors. Some prospective teachers' opinions on factors that had lessened or removed resistance towards research are stated below as examples. Moreover, the factors affecting their resistance are positively summed up in Figure 2.

(P18) "Seeing the positive results of research encouraged me to do more research. We encountered the positive results of the experimental application in the kindergarten class, and I stated that I was glad to have learned how to prepare a digital story on my own."

(P24) "At the end of the course, my resistance towards research disappeared because I was interested in it. Sharing what we had researched with our friends at the end of it, discussing it with them, preparing a digital story based on the research results, and observing the positive effects of the digital story on early childhood education made my negative views on research become positive. Now I like researching."

Qualitative findings on the experimental group's resistive behaviors toward technology-based instruction. Answers to the question "What kind of resistive behaviors do you show toward activities related to technology-based instruction at the university you are studying in?", which had been asked before the experimental procedure, were examined as the sub-themes of *showing resistance* and *not showing resistance* under the theme of resistive condition. This theme is explained with the codes *avoidance* (n = 13), *unwilling to adapt* (n = 5), *talks back* (n = 1), *communicates directly* (n = 3), *cheats* (n = 1), *gets support from other students* (n = 1), and *blames the instructor* (n = 2). Upon examining the experimental group's answers, prospective teachers' show of resistance was inferred in general as procrastination prior to the experimental application. Some of the prospective teachers' views supporting this finding are presented below:

(P10) "I generally fear the possibility of not succeeding. I am anxious because I'm incompetent at using technology. Because of my anxiety, I prefer to sit in the back."

(P11) "People generally avoid expressing their opinions. I get bored during the course and think that technology isn't integrated into the instruction correctly. So I don't listen to what is explained in the course."

(P24) "I try to talk to the instructor, but I am not taken into consideration."

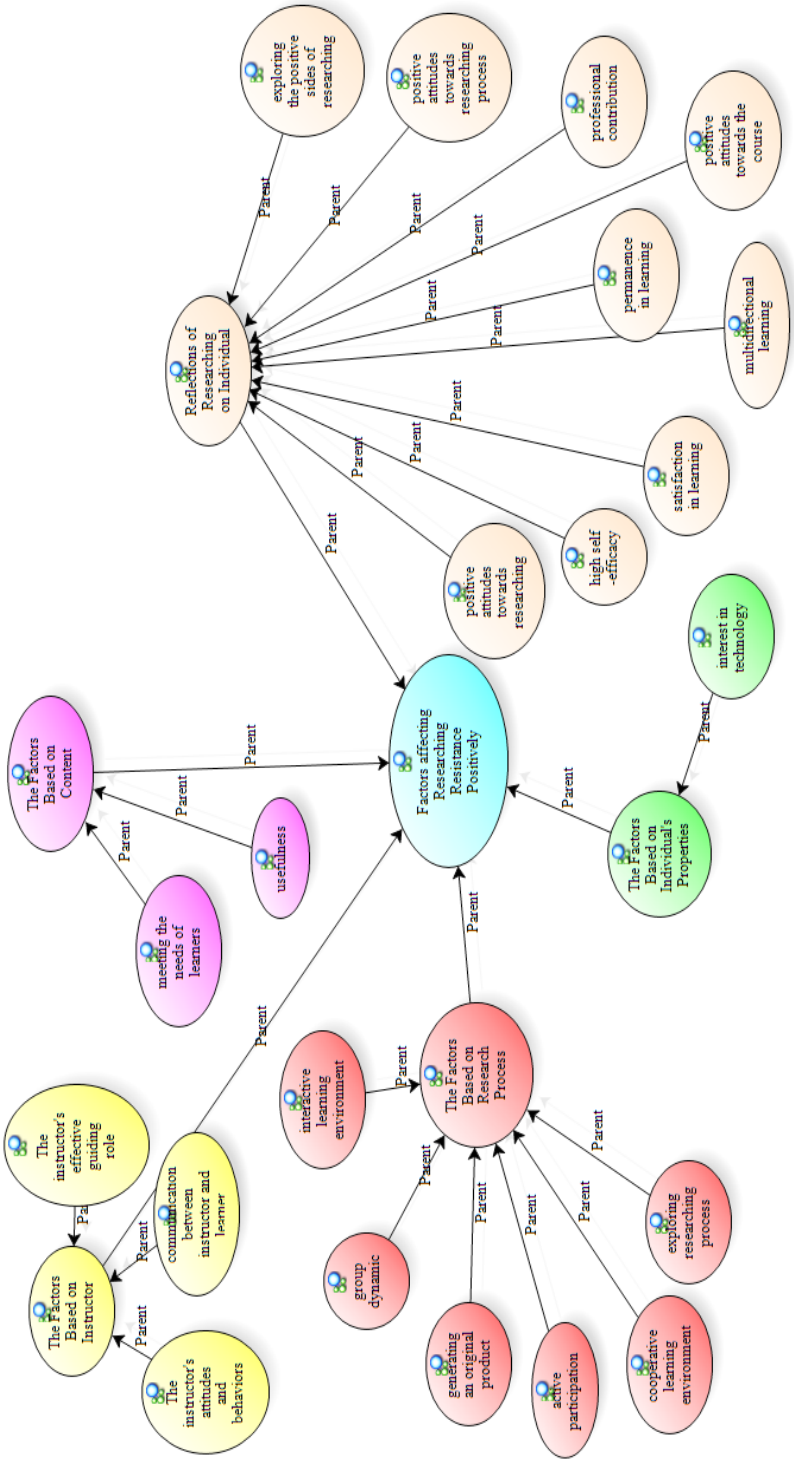

Figure 2. The effect of the experimental procedure on resistance toward research.

Prospective teachers who had prepared a digital story through the inquiry-based learning approach and had taught with the help of their own prepared digital story in the preschool and kindergarten application stated that they didn't show resistance towards technology-based instruction (n = 22). After the experimental process, the experimental group witnessed the positive effect of technology-based instruction (n = 17), the positive effects of digital storytelling (n = 17), and technology-based instructional activities (n = 10); these were listed as the reasons why their resistive behaviors toward technology-based instruction had lessened or been overcome. The fact that the experimental group observed how technology had been integrated into instruction, encountered technology-based instruction's innovativeness, and explored the advantages of digital storytelling provided the prospective teachers with positive opinions on technology-based instruction. Some of the prospective teachers' views supporting this finding are presented below. The factors affecting their resistive behaviors towards technology-based instruction are also summarized in Figure 3.

(P10) "I adopted technology-based instruction in this course because we had observed the children's positive reactions when we integrated the digital story into the instruction for the preschool and kindergarten application. The preschool and kindergarten activity made me more excited. From my point of view, the knowledge we obtained from the course is abstract. We should be given a chance to apply this abstract knowledge. Because we were making presentations through Power Point during the course, I hated using technology there because I was learning nothing. When I found a chance to teach the preschool and kindergarten children with the help of a digital story and observed their happiness, I was convinced of technology-based instruction's effectiveness."

(P19) "Finding the applicable field in which our prepared original material could be used, how this material grabbed the children's attention, the children's feedback about our prepared materials, and how we observed digital storytelling's contribution on their learning allowed me to perceive that technology-based instruction makes learning easier and grabs the learner's attention."

Discussion

For the experimental group, the prospective teachers' resistance toward research levels had lessened compared to the control group after the experimental application process. This infers that the experimental process had had a positive effect on prospective teachers' resistive behaviors towards research. This also implies that participation in any research activity positively affects learners' sensitivities. Learner's resistivity also has a sensorial property, just like motivation, attitude, interest, and

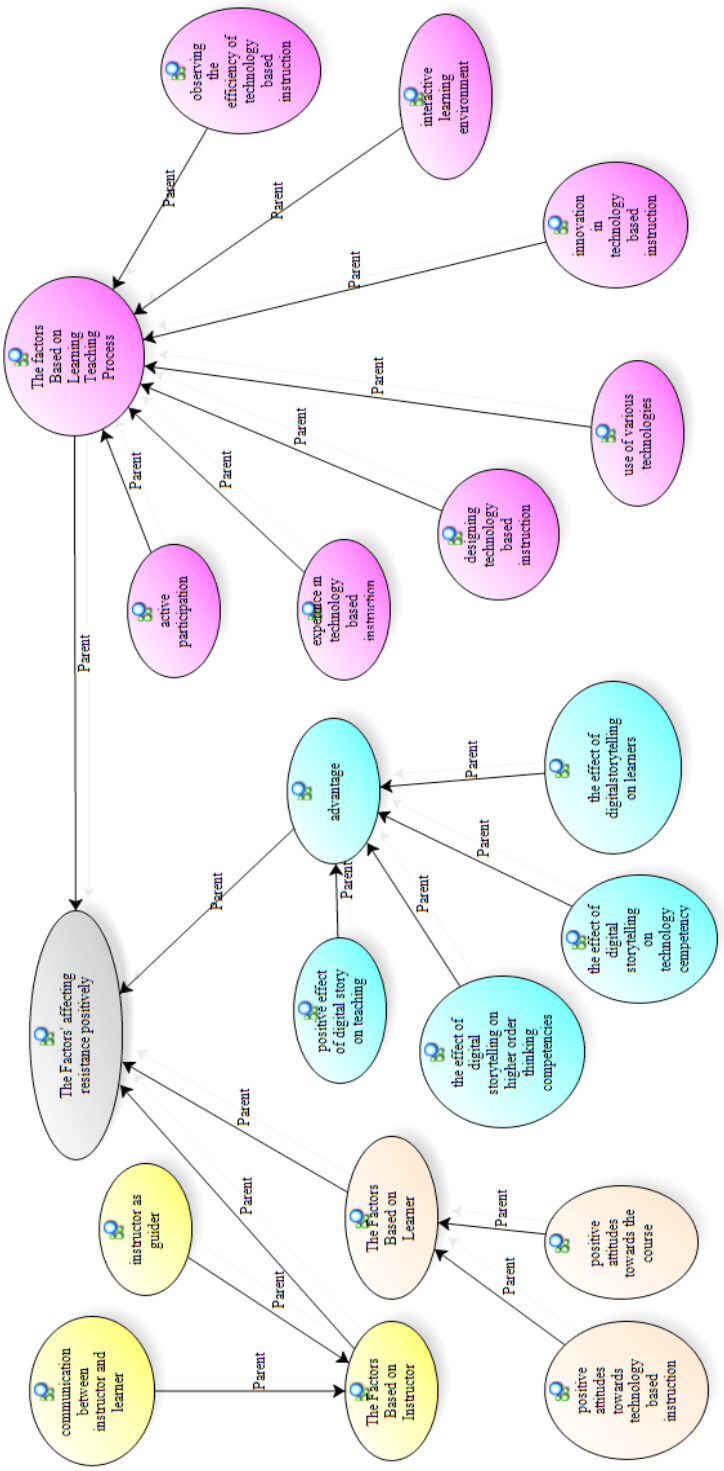

Figure 3. Factors affecting resistive behaviors toward technology-based instruction.

so on. Having learners' who are not only cognitive but also sensitive to desirable changes is one of the goals of the curriculum. The effect of teaching methods and techniques on positively altering learners' sensorial properties in a desired way has been long discussed in the literature. For example, Gibson and Chase (2002), in their research on the sensorial effect of inquiry-based learning, emphasized that doing research increases learners' attitudes and interests. Zientek et al. (2011) stated the positive effect of these teaching methods and techniques on prospective teachers' attitudes. Also, the Boyer Commission (1998) described inquiry-based learning as a way of creating a sense of research. Bilgin (2009) stated that directed research gives university students a positive attitude towards inquiry-based learning. Bilgin explained this positive attitude as providing learners with the opportunity to research as a small group, which has learners more easily explore the relationships among concepts, structure their own ideas, and share their ideas with others. Therefore, this process turns into a learning experience that makes students' learning easier. The positive traces of this process provide learners with positive sensitivities and allow them to turn negative feelings and opinions into positive ones.

The difference in resistive behaviors towards making research between the experimental and control groups can be inferred to have occurred as a result of the difference in teaching methods and techniques. Meijerman et al. (2013) stated that traditional teaching methods are limited at transferring knowledge and cause learners' motivation to decrease. Compared to explanatory teaching methods, other teaching methods that motivate learners are ones where students are active in exploring knowledge and in structuring their own knowledge. Many studies in the literature have focused on the effect of inquiry-based teaching on motivation (Bayram et al., 2013; Marx et al., 2004; McCornick, 2008; Oliver, 2007; Prince & Felder, 2007; Tuan et al., 2005; Wimpey, Wade, & Benson, 2011). Shamsudin, Abdullah, and Yaamat (2013) stated that inquiry-based teaching provides individuals with positive attitudes during the course, whereas individuals tend to have negative attitudes in traditionally taught courses because of factors such as uninteresting presentations, intense writing activities, and limited practice. Moreover, other studies in the literature have stated that those who participate in inquiry-based learning activities have positive opinions about inquiry-based learning (Keefer, 2002; Tatar & Kuru, 2009). In these studies, participants stated that they had considered these inquiry-based learning lessons to be more instructive; they appreciated the learning process and their learning was permanent. Therefore, positive outcomes from these learning experiences can be said to have affected individuals' resistance towards research.

Both the experimental and control groups' resistive behaviors towards technology-based instruction were found to be similar before the experimental process. The post-test scores for both groups' resistance towards technology-based

instruction didn't statistically differ after the experimental process. However, a statistically significant difference was found between the pre- and post-test scores for the experimental group's resistive behaviors towards technology-based instruction. Although the control group's post-test scores did decrease, there wasn't a statistically significant difference between their pre- and post-test scores. This finding indicates that the experimental group's activities had a positive effect on the prospective teachers' resistance towards technology-based instruction. Ertmer (2005) emphasized the difficulty of turning teachers' negative views on technology integration into positive ones. Moreover, Ertmer (2005) stated that personal experiences shape individuals' positive and negative perceptions on technology integration. Preparing a digital story not just with the explanatory learning approach but also with the inquiry-based learning approach, in addition to integrating digital stories into their instruction, affected the prospective teachers' perceptions of technology integration. The experimental group observed that through these experiences, the use of technology for teaching motivates students, makes their learning easier, and allows them to be more participatory in activities. In parallel with Ertmer's opinion, the personal experiences from the current research can lead to changes in individuals' resistive behaviors toward technology-based instruction.

Prior to the experimental application, a large number of prospective teachers had been observed to have resistive behaviors towards research, such as procrastination, unwillingness to adapt, talking back, communicating directly, and cheating. Afterwards, prospective teachers' perceptions toward research became more positive. Positive perceptions towards research have become a precursor to lessening or overcoming prospective teachers' resistance towards research. In Burroughs, Kearney, and Plax's (1989) study, which was performed to determine students' resistivity in the area of higher education, they stated that students had shown resistive behaviors such as were shown in this study. Sever (2012) pointed out that 7th grade students had shown resistive behaviors like non-participation and being uninterested in class. According to Sever, some students had also shown resistive behaviors such as talking back to the teacher, not caring about their friends or the teacher, and being distracting. In the literature, studies have focused on student resistivity. This implies that students show similar reactions to teaching and learning activities.

The experimental group stated that preparing a digital story using inquiry-based learning had positively affected their resistive behaviors towards research. Having positive attitudes towards research, providing meaningful and useful content for learners, having an instructor who can effectively guide, and having an interactive and cooperative learning environment are listed among the reasons for positive effects of performing research when they are explored. Yuksel (2006) also pointed out that not having practical content for learners leads to a passive resistance in undergraduate

students. In this study, the difference of having prospective teachers prepare a digital story in accordance with their needs and interests positively affected their resistance towards research. Many prospective teachers emphasized that instructors who were effective guides and learning environments that were interactive and cooperative had had positive effects on resistive behaviors. In parallel with the findings of this research, Lea, Stephenson, and Troy (2003) stated that instructors who did not play a guiding role could be a cause of student resistivity.

Learners' positive attitudes toward the course, using diverse technologies, observing how to integrate technologies into instruction, witnessing the effectiveness of technology-based instruction, viewing the positive effect of digital storytelling on learners, and exploring innovation in technological integration and instruction were listed as factors that had decreased or overcome resistive behaviors toward technology-based instruction. Ertmer (2005) emphasized that training teachers how to use simple but effective technological tools and how to integrate them into instruction starts the process of teachers' adaptation to technology and technology-based instruction. In this sense, the experimental group can be said to have begun adapting to technology-based instruction with the help of exploring digital storytelling and learning how to integrate their digital story into their instruction. In the study, the experimental group was able to experience new technologies. The digital storytelling method and the use of this method in preschool and kindergarten classes were an innovation for them. Sadik (2008) stated that preparing a digital story increases students' awareness of new media technologies. Moreover, prospective teachers viewed the contribution of digital storytelling on children's awareness and their sensitivities had lessened their resistance towards technology-based instruction. Despite the limited number of studies on the effectiveness of digital storytelling, these studies indicate some of the positive effects of digital storytelling. For example, Dogan (2007) stated that in Houston University, the teachers who had participated in a digital storytelling workshop described the digital story as a powerful and effective instructional tool for expressing points in a subject area. Teachers were emphasized to have found digital storytelling to be beneficial at drawing students' interest to the contents and at allowing abstract concepts to become more concrete.

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