Original Article

Improvement of Clinical Education of Radiography Skills with a Participatory Approach: An Action Research

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Abstract

Background & Objective: This study aimed to recognize the clinical education challenges of radiographytechnology students and to improve the current clinical education status by the action research approach.

Materials & Methods: This was action research performed by Kemmis and McTaggart approach in four academic semesters during 2019-2020 at Shahrekord University of Medical Sciences. In total, 48 third and fourth-year radiographytechnology students, as well as the department chairman and two educators were enrolled in the study. Individual semi-structured interviews were made with the subjects with a focus on the identification of problems and presenting solutions. In addition, data were analyzed by a conventional content analysis method. The proposed strategies were exploited in the implementation stage and the effectiveness of the program was assessed by individual interviews and group sessions.

Results: The planning stage findings demonstrated that improper design and organization of apprenticeship programs, incompatibility of clinical courses with theory courses, inefficient training in the hospital, inadequate summative evaluation, and lack of welfare facilities in the hospital were regarded as barriers to clinical learning of students. Following determining and classification of issues, measures were taken in the implementation stage in cooperation with the educational authorities of the faculty and clinic to achieve goals in this field. In addition, observation and reflection results confirmed students' satisfaction with early return measures.

Conclusion: The participation of clinical education experts and radiographytechnology students led to a more accurate understanding of problems of clinical education and examining possible solutions to improve the situation. Students were clearly satisfied with the changes made in the implementation stage. Overall, students had a positive reaction for being a member of the planning group to eliminate their education problems.

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Introduction

Radiography technology experts have the mission of preparing medical images and protecting patients against used beams. Therefore, the employment of unskilled graduates can lead to dissatisfaction of physicians with unfavorable image quality, repetition of the imaging process, increased radiation absorbed dose of patients, increased center expenditures and equipment depreciation (1). Accordingly, 18% of credits of the BSc in radiography technology is internship and apprenticeship, the latter being responsible for the adjusting of students' training with practice, understanding possible defects and improving professional competencies (2).

However, some of the problems of apprenticeship courses of various fields of medical sciences include several challenges and incompatibility with the needs of society (4-13). Nonetheless, there is limited research on the clinical education of radiography technology students. For instance, a study focused on effective factors on the satisfaction of medical radiation students from clinical training at Babol University of Medical Sciences (3). Ebrahiminia et al. reported the current clinical education quality from the perspective of radiography technology students (4). Meanwhile, dissatisfaction of students, instructors or both of unfavorable clinical education quality has been reported in other fields of study, including nursing (5-7), healthcare service

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management (8) and environmental health (9). In general, different problems occur in apprenticeship courses of various disciplines, including lack of coordination of theory courses and clinical performance, unclear clinical education objectives, stressful hospital environment, lack of transparency in students' responsibilities in the ward, the low intention of instructors to be present in clinical environments, lack of empathy between instructor and student and lack of facilities for students. Therefore, there is a need for revising clinical education in this area (3, 10-13), and the field of technology is no exception.

Development and revision of training programs have been carried for training experienced manpower in order to institutionalize responsive education from the policies of the Transformation Plan (14). Nonetheless, clinical education revision requires the identification of the existing problems (15), which will contribute to the improvement of clinical education methods and the development of responding to the community's needs (2). In fact, students' and educators' opinions can be used to evaluate the existing status, recognize the strengths of the courses and correct their defects, which will pave the way for the expansion of future programs (5). Therefore, the quality of clinical education has been assessed from the perspective of students in various fields in Iran (4, 5, 8, 12, 16, 17) and other countries (6, 11, 18, 19) in a descriptive and cross-sectional manner and by using questionnaires. Meanwhile, the improvement of clinical education requires the recognition of the current conditions from the perspective of students and participatory action to change the situation. Experts believe that studies must go beyond the description of events and explain what can be instead of what it was and is. This is possible by action research (12, 20), which is a participatory approach to a deeper understanding of the problem in real space and a realistic decision to change the status (21). A review study on action research in health science education showed that the method can be used in areas of clinic, education and health management. According to the results, the method improved care, education, management and professional development (22). According to Adams et al., qualitative research plays a significant role in finding a solution to improve education in radiography technology students (23). A literature review revealed a lack of study on the correction of students' clinical education status in the field of radiography technology. The present study used the action research method to improve the current status of the radiography technology apprenticeship course with the help of the students of the field. The main goal was to identify problems in this area and propose solutions for improving the quality of education and generating favorable apprenticeship programs that fit the professional needs of students.

Materials and Methods

This was a qualitative study performed with participatory action research based on the technique presented by Kemmis and McTaggart (27) in stages of planning, implementation and reflection (assessment). The study was performed in the Paramedicinal School of Shahrekord University of Medical Sciences during four half semesters since 2019 (Figure 1).

Subjects were selected by purposive sampling, and a department chairman (one person), two instructors of radiography technology and 48 students were enrolled in the research. The participants included a male department chairman with 27 years of work experience, two female instructors with four and six years of teaching experience and 33 female and 15 male students in the age range of 20-22 years. In the first stage (planning), individual semi-structured interviews were conducted with the participants to identify problems and provide solutions (in a quiet and secluded environment in the faculty). The process continued until reaching data saturation, and the interviews were recorded following receiving permission from the participants. First, the research

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objectives were explained to the subjects and they were ensured of the confidentiality terms regarding their personal information. Interviews were analyzed manually by conventional content analysis using a method by Elo and Kyngäs (28) (Figure 2).

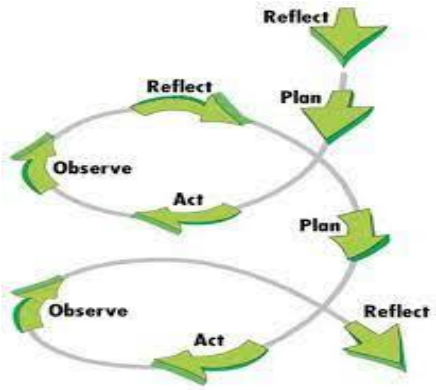

Figure 1: Action Research Cycle

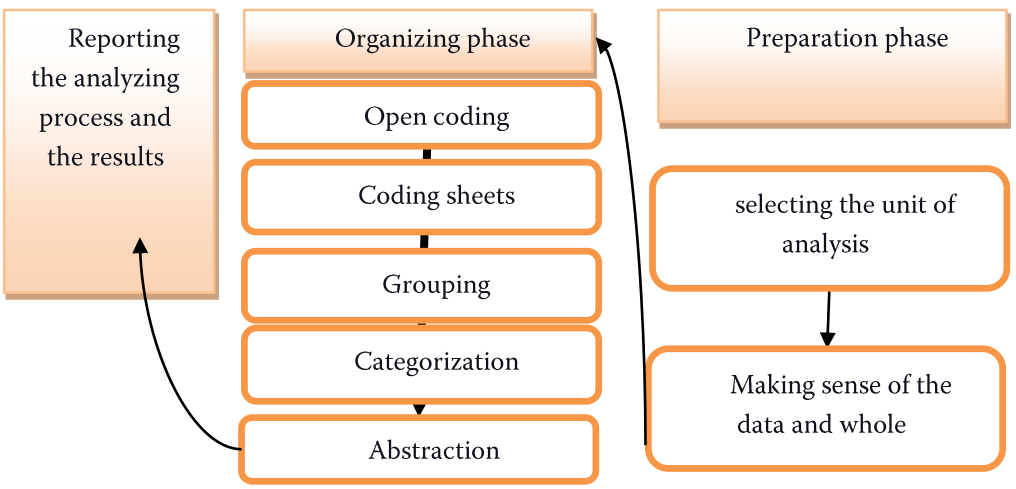

Figure 2 Preparation, organizing and resulting phases in the content analysis process

To this end, all descriptions were studied several times until attaining a general understanding of it. In addition, titles related to the studied items in the margins of the text in order to cover all aspects of the text as much as possible. Afterwards, all titles were written on coding sheets and classified into groups, each of which was given a title. Ultimately, groups and categories were made, and at the end of the each interview, each participant was asked whether they were willing to participate in the action research project for applying their operational solutions or not.

At the beginning of the second stage (implementation), problems and solutions extracted to change the existing status were reviewed with all participants over eight (6-8-member) focus group discussion sessions and the final consensus was reached. In the end, the potential solutions were prioritized by the subjects using a Delphi method

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(within the approved framework of the educational program while considering barriers and facilitators of each solution). Even though a number of proposed solutions could be implemented and assessed during each academic semester, some items required completing administrative steps and funding and so were subject to the passage of time. Therefore, preliminary steps were taken in this respect. However, due to the consensus of the participants, the application of these solutions in the educational program and their assessment were postponed to another time in the future. In addition, a consensus was reached regarding the method of implementation of necessary solutions to improve clinical education. Following receiving consensus, a proposed program was designed with full details and implemented.

The third (observation) and fourth (reflection) stages were carried out almost simultaneously with each other and with the second stage and included continuous evaluation of new issues after the implementation of the program and identification of possible issues based on the individual notes of the participants, as well as determining the effectiveness of the program with the help of individual interviews and group meetings. To determine possible issues at the beginning of the program, the participants were asked to write down or record observations, ideas, disadvantages, advantages, and any point related to the implementation of the program and its effect. During the program, individual interviews were made with the subjects, and a group meeting was held every month to determine weaknesses and possible problems. The notes and interviews with participants helped us in understanding whether the interventions were effective or not and which parts were more important to the respondents. In addition, we could recognize the barriers and facilitators of the field such that the changed method could continue in case of positive changes or it could be stopped and revised if required.

Data trustworthiness were assessed by applying prolonged engagement (to reduce the threat of participant bias and increase credibility) (29) peer review (to reduce the risk of researcher bias, increase credibility, and increase the neutrality and objectivity of data) (30), member check (to reduce the threat of researcher bias, participant bias, to increase reliability and increase data neutrality and objectivity) (31) and in-depth description (to increase transferability) (32). While prolonged engagement may not be possible in interview-based studies, performing more than one interview is a step in the right direction (36). In order to establish prolonged engagement in this study, in-depth interviews were made with the participants in more than one session so that the subjects could have a deep understanding of the issue. Afterwards, the interviews performed were provided to the participants and professors to review the content accuracy of the interviews. In addition, the researcher checked the data with the participants at various data collection and analysis stages to ensure that the experience of the phenomenon was expressed as perceived by the participants.

Results

In the planning stage, eight themes were extracted after the analysis of the data obtained from interviews with the participants, including “inadequate design and organization of internship programs, incompatibility of apprenticeship courses with theory courses, inconsistency of apprenticeship programs with responsive training programs, need for basic training of apprenticeship activities, inadequate summative evaluation method, inadequate monitoring of apprenticeship programs, inefficient training in the hospital, and a lack of basic facilities in the hospital” (Table 1). According to the results in the second stage, it was decided to take steps toward the elimination or decrease of the five problems, which were gradually followed over four semesters to improve the current situation of the radiography technology apprenticeship. Following that, selected problem and performed approach and the results of observation and reflection were provided.

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Table 1: main obtained challenges for clinical education

Main category	codes
Inappropriate planning	inadequate design and organization of internship programs
	incompatibility of apprenticeship courses with theory courses
	inconsistency of apprenticeship programs with responsive training programs
Inappropriate implementation	need for basic training of apprenticeship activities
	inadequate summative evaluation method
	inadequate monitoring of apprenticeship programs
Lack of facilities in clinical setting	inefficient training in the hospital
	a lack of basic facilities in the hospital

"Inefficient Training in Hospital"

In the planning stage, one of the problems of the students was reported to be "inefficient training in hospital environment". Overall, 24 students pointed out the inadequate clinical space for training. For instance, one of the students expressed:

"In the hospital…students are not allowed to use (old and new) devices. Some employees…do not allow independent work. Meanwhile, students are able to perform ordinary radiography from the third semester. Some of the non-educational personnel give an opportunity to experience and provide comprehensive explanations. In contrast, some of them avoid answering our questions. In addition, a number of employees complain about students' work without explanation and in some cases without any reason."

Another student marked:

"In a dentistry clinic… limited and crowded space does not allow students to experience. OPG radiography is simpler than periapical radiography and can be learned by observation. However, periapical radiography needs experience. Theory education of teeth radiography is not provided. The staff believes that learning is not possible without experiencing while there is no experience opportunity."

According to another student:

"Angiography apprenticeship in the form of distance observation is not efficient."

In total, 18 students specifically mentioned apprenticeship problems in the MRI department. In this regard, one of the students complained:

"Non-educational staff of the MRI department avoids explaining about the process due to interference with the education provided by instructors. For instance, education is not provided when none of the educational staff are present in the shift. It is appropriate to separate the staff shift from training shifts."

In total, 13 students were dissatisfied with the performance of some of the instructors. In this respect, one of the students stated:

"Instructors are expected to accompany students in the clinic and provide the necessary explanations. In fact, the presence of the instructor of imaging assessment and techniques in hospitals will be useful for implementing useful non-conventional techniques. It is appropriate to use these techniques during relevant apprenticeship simultaneously in a semester."

To deal with this issue, a number of non-educational staff were requested to give students the chance to experience in order to assist their education. Official rewarding of non-educational staff by the faculty will encourage their cooperation. A number of students, who warned the improper performance of the staff in an inappropriate way, did not receive suitable feedback from them. Therefore, a number of student-staff communication skills were

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taught individually and in groups. The full-time presence of experienced instructors in the hospital and their overlooking of the ward affairs can help meet this demand of students. The faculty has the plan to recruit these forces, which can be possible after passing the legal processes. Recruitment of a number of graduates of the faculty has been carried out in angiography and dentistry wards in the form of the implementation of the human resource project. Observation and reflection of measures and re-assessment of students' opinions showed an increase in their level of cooperation as a result of communication with employees. Meanwhile, others did not allow students to experience due to the belief that their mistakes could lead to problems for the staff in the ward. It is hoped that this issue is eliminated through more effective communication with the staff. In general, the students stated that the staff had more trust in them, which led to their higher satisfaction with the students. Learning communication skills was able to help improve the relationship of a number of students with staff, and staff was satisfied with this issue. In fact, students were satisfied with the presence of recruited staff and were encouraged to learn the necessary skills. In the planning stage, the presence of students in the MRI department was limited to the presence of teaching staff. Preparations were made for the recruitment of a hospital-based instructor.

"Lack of Basic Facilities in Hospital"

Another problem of the students was "a lack of basic facilities in the hospital". They mostly complained about having at least a changing room. Due to the fact that the previous action of the students regarding the changing room was ineffective, the request was followed up again in the new management system. Therefore, closets and a changing room were provided to the students by expanding the physical space of the hospital. Observation and reflection showed students' relative satisfaction with provided facilities. While the students complained about the distance between the changing room and the ward and the simultaneous use of the room by several students, they were satisfied with the fact that their complaints were followed up.

"Inadequate Design and Organization of Internship Programs"

"Inadequate design and organization of internship programs" was another issue mentioned by 16 students. In this regard, one of the students marked:

"The apprenticeship course is held in a hospital that is very far from the place of holding the theory classes, which leads to students' delayed arrival and being reprimanded by the instructor and even not being able to attend the class. On the other hand, holding theory classes after the apprenticeship is not that efficient due to students' fatigue. In addition, we should be able to leave afternoon classes sooner."

Another student asserted:

"The time of the apprenticeship course must be proportional to patient visit rate in any clinic. For instance, the best time for apprenticeship course in … clinic is three-seven p.m."

Three students talked about apprenticeships in interventional radiology and dental radiography wards. A student believed:

"Dedicating special hours to fluoroscopy, angiography, dental radiography, and portability will help students focus on those areas, which will improve their education. Observing random cases of fluoroscopy during radiography internship would not be efficient because students might be busy and do not even see it. In addition, the lack of presence of all students in the fluoroscopy room and the lack of forcing the students to perform the process will prevent full education. In other words, these skills will be learned by holding students accountable and including them in educational planning."

In total, 10 students complained about the course presentation order. For instance, a student expressed:

"Lack of concurrent education of apprenticeship with theory courses leads to learning without a subjective imagination of the area and forgetting the

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theory principles in the next semester. For instance, angiography theory is taught in the fifth semester and its apprenticeship course is taught in the seventh semester at low quality. The concurrent education of the technique and apprenticeship can help better learn and better perform in the apprenticeship course."

Six students talked about the current rotation status. One of them mentioned:

"It is better to rotate students in wards after ensuring their adequate experience in the ward. It is not efficient to immediately put them in rotation after being briefly familiarized with the device and the imaging method."

In addition, 23 students criticized credit planning in the course. For instance, one of the students affirmed:

"Students forget a part of their learning and will be away from the hospital space for a long period due to a nine-month distance caused by lack of holding an apprenticeship course in the sixth semester. In contrast, apprenticeship in the second semester is not efficient due to a lack of a theory background. While imaging of body limbs is taught in this semester, most clients require imaging of the trunk and chest. Meanwhile, starting apprenticeship from the third semester with knowledge of limb imaging and simultaneous education of trunk imaging is more efficient."

In this study, four students complained about a lack of familiarity with terms. One of the students expressed:

"Some courses, such as terms, are better to be presented at the beginning of the BSc course so that the terms could be used during clinic visits."

In addition, nine students proposed a change in the program. For instance, one of the students asserted:

"CT technique and apprenticeship must be taught in one semester and MRI technique and apprenticeship must be taught in another semester. In fact, the simultaneous presentation of the two imaging methods could be confusing in most cases."

In addition, six students believed:

"Simultaneous apprenticeship of students of different semesters is effective in learning from other students."

Three students mentioned the number of apprenticeship course hours. One of them stated:

"The time of students' attendance in a radiography technology ward is low, compared to fields of studies such as nursing, which requires students' presence in the hospital two days a week to receive two apprenticeship credits."

Measures taken in this field are explained below. The chairman of the radiography technology department became aware of students' opinions. While several limitations were mentioned, some solutions were proposed at the end. It was decided not to hold theory classes in hours immediately before or after an apprenticeship in future programs. In addition, an agreement was achieved regarding presenting a part of the fifth-semester apprenticeship course credits in the sixth semester to compensate for the delayed presence of students. In addition, making changes in the course presentation order was delayed to future semesters in order to observance the order of prerequisite and required courses. Since performing all of the mentioned measures required the passing of time, their observation and reflection results cannot be reported. However, all decisions and negotiations made were informed to students due to the nature of the study.

"Incompatibility of Apprenticeship Courses with Theory Courses"

According to 17 students, "incompatibility of apprenticeship courses with theory courses" was another problem that required correction. In this regard, one of the students mentioned:

"Most techniques used for training theory courses are outdated. It is better to more focus on conventional techniques. Most clients visit … hospital for chest x-rays. In addition, most cases are the same

in the trauma center. The majority of techniques have been replaced with CT scans. What is the point of studying all of these techniques and only to the extent of their memorization? Where can we learn these techniques if they are necessary?"

Overall, 11 students mentioned the distance incompatibility between theory courses and the use of theoretical knowledge in practice. One of the students mentioned:

"Some of the techniques do not match the theoretical method. In addition, the principles of protection against x-ray are often neglected by employees."

In this study, 14 students addressed weak patient care skills. One of the students marked:

"Courses in professional ethics and patient care failed to empower us in how to deal with patients and staff, as well as injections. Similarly, education in practice, which had 0.5 credits, could not respond to our needs and attendance of the emergency ward along with nursing students can be effective."

In total, 14 students referred to the lack of usefulness of the apprenticeship course in one of the wards. One of the students believed:

"Excessive time is allocated to ultrasound theory and apprenticeship courses. It would be efficient if a part of this time is allocated to radiotherapy and nuclear medicine training."

This subject was discussed in the radiography technology department group, and it was decided to change 20% of the educational curriculum by instructors of each course and present revisions to the department chairman. If approves, the changes can be used to present the necessary syllabus to students.

Discussion of this issue in the meeting led to the conclusion that the proposal to change the educational curriculum to the allowable level of 20% by the teachers of each course was presented to the group director and if approved, would be a step towards providing the necessary topics for students. Since one of the objectives of the patient care course is learning how to administer medication but students lack the necessary skills, it was decided to develop a student skill improvement program through attending emergency wards. In addition, the instructors were reminded of the importance of injection skills for radiography technology students. Given the fact that intervention requires long-term planning, the results of the present research are not visible. Therefore, observation and reflection of the results were not carried out in this section. Yet again, all decisions and negotiations made were informed to the students owing to the nature of the study.

"Inadequate Summative Evaluation Method"

"Inadequate summative evaluation method" was another problem mentioned by 22 students. According to one of the students:

"Apprenticeship evaluation by theory questions and scoring with a final point cannot determine students' capabilities. The evaluation must be continuous and based on the opinions of experts. The exam is not organized and each instructor has a different method in this regard. Some instructors ask questions that are neither mentioned in the theory course nor the practical course. Meanwhile, we would be regarded as ignorant if we were unable to answer these questions. In some cases, the apprenticeship exam is the same as the exam of techniques. To have a fair judgment, the exams must be based on the educations provided during the past course. The score of performance during the course should have a maximum share of the apprenticeship score. In addition, all students of the same semester must be assessed by one instructor so that there is no difference in their evaluation."

In total, eight students complained about logbook presentation. One of the students marked:

"We lack the skill to write in our logbooks, especially in CT and MRI. Students mostly focus on working with the software in CT and MRI apprenticeship instead of gaining experience in the field of techniques, which cannot be written in the logbook."

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In addition, 11 students pointed out the improper evaluation:

"The effective and regular presence of students does not seem to have been involved in their evaluation."

It was decided that all instructors should be sensitive to recording the time of arrival and attendance of students and applying its points in the evaluation and asking students to submit special points of their observations in the form of a logbook every day. In addition, preparing a standard framework for logbook writing became the responsibility of instructors. It was decided that the practical test of all students in each of the apprenticeship credits should be performed by one of the instructors so that the evaluation criteria are the same for all. Other instructors will evaluate the students according to students' skills, regular and active presence in the ward, and methods of dealing with the patient and interacting with the instructor, staff and other groups. The final grade will be the practical grade point average (GPA) and the total grades of the instructors. Observation and reflection stages of two rounds of implementation of the method revealed a decrease in students' objections to discrimination in assessment and an increase in their interest in work due to believing that differences are recognized by the instructor. It should be noted that these cycles are still continuous in order to achieve the desired state.

Discussion

The findings of this study, which is the result of interaction between the researcher and the participants, showed that improper hospital space and facilities, lack of basic welfare facilities in the clinical education environment, inappropriate design and organization of apprenticeship programs, incompatibility of apprenticeship courses with theory courses and inappropriate student assessment methods were among the problems of the apprenticeship course. According to the results, the clinical education status of radiography technology students could be improved by the action research approach. Some of the important shortcomings of clinical education included the lack of experienced instructors and the limited number of students in the use of equipment. Another research has mentioned a shortage in the number of instructors and a lack of job discretion for students and instructors as nursing apprenticeship problems (20). In this regard, our findings are consistent with the results of some of the studies performed in this area (7, 9, 15, 20, 24). Stress in a stressful hospital environment, improper communication and insufficient teacher-student interaction, low motivation of educators and students, unclear educational goals, lack of experienced instructors and insufficient opportunity to acquire skills make the clinical environment unfavorable for acquiring skills (7, 9, 15, 20, 24). Meanwhile, the application of participatory strategies can improve the attitude of clinical learning staff towards students. Although it is legally impossible to involve all staff in education, once it is realized, it will provide a suitable environment and opportunity for students to learn (20). In participatory models of clinical education, students' self-confidence and competence in clinical care increase due to the integration of educators' expectations of them (20, 25). Clinical staff support for students increases self-confidence, patient communication skills, responsibility and student satisfaction in clinical nursing education (20, 25). Most of the existing studies are in the field of nursing and are not in the field of radiology. However, the current experience of action research demonstrated that the positive effects of this partnership can be felt tangibly even without the implementation of a systematic and specific participatory model and only by establishing a few simple solutions. Even when actions were not implemented or stalled and participants were pondering them, they expressed a sense of self-sufficiency in trying to change.

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In the present study, one of the clinical education problems was the lack of basic facilities in the hospital, which was also reported in another research as an apprenticeship problem (3). In a previous study, students were mainly dissatisfied with a lack of welfare facilities and physical space and a lack of holding briefings during clinical education courses (15). Therefore, it is necessary to provide proper welfare and educational facilities for students in the hospital. Expecting students to take on the responsibilities of employees without being provided with the least welfare facilities in the clinic will result in inadequate skill learning in students. According to the results of the current research, helping students and presenting a report of successful or unsuccessful activities of instructors significantly affect their performance.

Another problem of the participants was improper apprenticeship programs. The dispersion of education in different wards deprived students of the opportunity to acquire sufficient skills in a variety of imaging techniques. Therefore, adopting more suitable plans for sufficient education of various skills to students could improve clinical education in the target group. In addition, nursing students have reported education dispersion in various wards due to inadequate clinical education (20, 24). It is necessary to provide suitable theory and clinical education content and adhere to theory course standards in clinical education. Some studies have reported a lack of fitting of apprenticeship courses with the theory course. In a study, 73% of the students reported the incompatibility of clinical conditions with theory (24). The theory-practice distance was introduced as one of the most important problems of clinical education (2, 7, 20, 26). In fact, compatibility of theory courses with practical skills and employing skilled and enthusiastic instructors for practical education improved the education process (9). In addition, more satisfaction and motivation were reported when all people worked toward the same goal in a participatory method.

The improper summative evaluation was another clinical education problem. Other studies have mentioned the necessity of clarification of educational objectives, expectations from students and evaluation benchmarks in clinical education. Expectations from students and their evaluation criteria should be clear and commensurate with the content taught (3, 20, 27). Quoting Oermann, Asadizaker stated: a student is a learner, not an expert. Therefore, student assessment must be carried out such that it fits their level of capabilities (20). Another clinical education problem was reported to be an unrealistic assessment (15, 20). Similar studies have reported unfavorable clinical education status from the perspective of students and instructors. In fact, people have mentioned issues such as instructors' inability to use theory principles in practice, dispersion of apprenticeship in wards, stressors in the hospital, forcing students to perform staff duties, lack of proper evaluation, and lack of coordination between theory education and clinical services (3, 5, 7, 12, 15, 20, 28). Overall, students had a positive attitude toward clinical education. In similar studies, the overall viewpoint of nursing students (more than 50%) was more negative than clinical education (2, 5, 12). In another study, students' views on the performance of instructors and the diversity of patients were good. However, in the areas of welfare facilities, they complained about student assessment methods and summative evaluation. In a research, students had a positive attitude toward the effect of clinical education on their abilities (29). According to the results of the present study, it is possible to improve the quality of clinical education of radiography technology students by action research and the participatory approach. Given the limited research population and duration of the study, generalization of the results must be carried out with caution. Addressing the problems of clinical education at the national level and applying appropriate interventions to improve the current situation is a great opportunity.

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Conclusion

Despite the limitations and late-return nature of some of the proposed changes, students' satisfaction with the changes witnessed during the implementation of the process was evident. The students had a positive response to being questioned as a member of the clinical education planning team, although they were skeptical about the improvement of the situation. The strengths and weaknesses of the program were related to the nature of action research. The results of this qualitative study are related to the study area and the generalization of the results to broad groups and other positions should be done according to the conditions of the qualitative study. Observing the effectiveness of some interventions required time and could not be assessed during the implementation of the research. Negotiation to encourage the motivation of a number of employees was not successful. Another limitation of the present research was a lack of sufficient authority of educational planners in providing the projected budgets. One of the strengths of the action research is the participation of all stakeholders, which helps to continue and facilitate the implementation of programs and achieve the goals. When a program emerges from inside of a community, the participants will help each other to achieve their goals, and barriers to the implementation of the program will be eliminated. In addition, group effort increases synergy and improves results, compared to the individual results. Students learned that they should be the ones who recognize problems and make changes and they should not wait for the authorities to act in order to improve their situation. It is hoped that this method be used by students to identify and eliminate other problems in life. According to the results of the present study, clinical education of radiography technology improved after the interventions. However, it is recommended that the action research cycle be repeated to ensure continuous quality improvement. Moreover, it is suggested that action research with broader participation of students be conducted to enhance the cooperation of planning authorities and improve clinical education quality.

Conflicts of Interest

The present study was an independent project and has no conflict of interest with other organizations or individuals. The current research has been performed as an educational process and by receiving permission from the related department. In addition, the department chairman and the instructors and colleagues were become aware of the research implementation method due to its type.

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